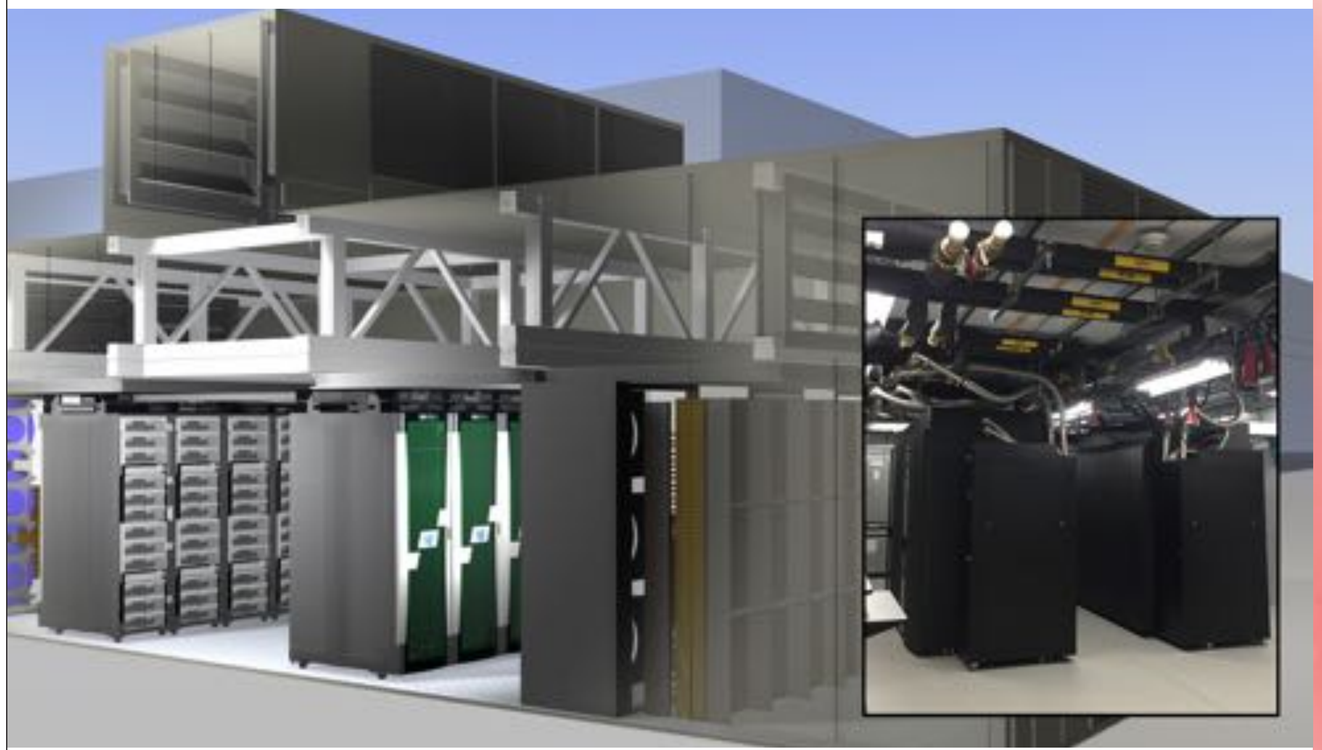
NASA's prototype Modular Supercomputing Facility houses Electra, one of NASA's most powerful supercomputers. Electra was constructed in two phases: the first module contains the initial 1,152 nodes, and the second module houses an additional 2,304 nodes. These modules are built with cooling systems that take advantage of the San Francisco Bay Area's mild climate, significantly reducing the electricity and water needed to remove heat from the systems. *Derek Shaw, NASA/Ames*



The Electra supercomputer is a dual-plane 9D hypercube utilizing both FDR and EDR InfiniBand for communications, and Intel Xeon Broadwell and Skylake processors for computation. This year, the Skylake portion of Electra doubled in size (inset), bringing the system to over 8 petaflops peak performance. With close to 125,000 cores and enhanced connectivity, Electra provides an excellent platform for NASA scientists to perform leading-edge scientific research and engineering work. *Marco Librero, NASA/Ames*

National Aeronautics and Space Administration

NASA's Module-Based Approach to Greener Computing

This year, NASA expanded the compute capability of the second module within its prototype Modular Supercomputer Facility (MSF), bringing the Electra supercomputer to over 8 petaflops peak performance—challenging the power of the agency's largest system, Pleiades. Further proving the effectiveness and energy efficiency of this evolving technology, the MSF maintains industry-leading power usage effectiveness—the ratio of power used by the computer to the total power used by the facility—of 1.025 (Module 1) and 1.036 (Module 2). The energy necessary to cool even densely deployed nodes is under 5%, with water reduction of over 90% from traditional facilities. NASA is continuing on this road to greener computing with the construction of a one-acre site that enables future expansions.

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